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THE DETERMINATION OF PLASMA VOLUME AND THE ESTIMATION OF BLOOD VOLUME IN THE HORSE

BY

M. T. I. CRONIN

ANIMAL HEALTH TRUST EQUINE RESEARCH STATION, NEWMARKET*

INTRODUCTION

Methods for the determination of total blood volumes in man and animals have been described by a number of workers. The principal methods are those employing dyes (Keith, Rowntree & Geraghty, 1915) and radioactive isotopes (Hahn, Ross, Bale, Balfour & Whipple, 1942; Anderson, 1942). Various modifications of the basic dye methods have been described and the advantages and disadvantages of them discussed, notably by Price & Longmire (1942). Most of the estimations have been made on rabbits, dogs and man. Only a few estimations of blood volume in the horse have been reported. Dukes (1942) cites a figure of 9·7 per cent. of bodyweight determined by Reichert & Brown (1909). Courtice (1943), in observations made on two horses, calculated a plasma volume of 5·1 per cent. and a total blood volume of 7·2 per cent. of bodyweight.

The small number of horse blood volume estimations made suggested the need for additional information, particularly in view of the increasing use of blood transfusions in horses and the importance of assessing the volumes of blood required for these operations. This necessity was felt particularly in connection with the evaluation of the efficiency of exchange transfusions in young foals affected with haemolytic disease. The present paper describes a method of using the dye technique for plasma volume determinations which is simple and satisfactory to use with horses. The results of its application in a four-year-old thoroughbred gelding in normal health but not in racing condition will be described. This animal weighed 496 kg. (1,093·5 lb.) and had been on a normal maintenance ration for some five weeks previously; it had been given daily light exercise.

TECHNIQUE

The blue dye T-1824 had been shown by Gregersen & Schiro (1938) to be satisfactory for this work and a supply of it was obtained from Messrs. Imperial Chemical (Pharmaceuticals), Ltd. A solution consisting of 1,000 mg. of dye in 100 ml. distilled water was prepared using standardised glassware. All injections of dye and removals of blood samples were made through a single polyethylene tube inserted in the left jugular vein. A 13 B.W.G. hypodermic needle was inserted through a previously prepared area of skin into the vein in the cardiac direction, and an 8-inch length of polyethylene tubing having a bore of 1·0 mm. and a wall thickness of 0·25 mm. was passed through the needle into the vein for a distance of about 4 inches. The needle was then withdrawn over the free end of the tubing. The tubing was held in position with adhesive tape and except when injections were being made or samples of blood were being extracted, the tube was closed with a polyethylene plug.

Syringes of the 20-ml. "Record" type were used for injection of dye solution and removal of blood samples. A 19 B.W.G. hypodermic needle was used to connect the syringe with the polyethylene tubing. The amounts of dye solution injected were determined accurately by using syringes of known weight and weighing each loaded syringe before making the injection. The actual injection of all dye in the syringe was ensured by washing out the syringe and tubing with blood drawn into the syringe from the vein and reinjecting it into the animal. Blood samples, each of 20 ml., were removed and placed in tubes containing sufficient dry ammonium and potassium oxalates to give final concentrations of these salts in the blood samples of 0·18 and 0·12 per cent. respectively. A portion of each sample was placed immediately in a Wintrobe haematocrit tube and centrifuged for 30 minutes at 3,000 r.p.m. for packed cell volume determination. The remainder of the sample was centrifuged and the plasma removed for colorimetric examination.

For accurate determinations of plasma volume it is essential to know the disappearance rate of the dye from the circulation of the subject under investigation. This necessitates the giving of at least three injections of dye at suitable intervals and determining the concentration of dye in the plasma on a number of occasions after each injection.

Gibson & Evelyn (1938) showed that the concentration of T-1824 in plasma could be determined accurately by means of a photoelectric colorimeter equipped with suitable filters. In the present work an Evans "EEL" colorimeter was used and solutions were examined in $\frac{5}{8}$-inch tubes. Using a 620M filter, the galvanometer reading of the original dye-free sample of plasma taken before the injection of any dye was set at zero. Subsequent plasma samples were read using this standard to set zero. All samples containing dye were also read using a 540M filter to correct for any haemolysis that might have occurred. Galvanometer readings (G) were converted to "L" values using the formula

$$L = 2 - \log G.$$

According to Beer's law L values are linearly related to concentration of dye in the plasma. L values were corrected for haemolysis using the following formula (Price & Longmire, 1942):—

$$L_{620} \text{ corrected} = \frac{(20 \times L_{620} \text{ as read}) - L_{540}}{20{\cdot}0 - 0{\cdot}6}$$

since by experiment with these filters and this particular lot of dye, it was found that the ratio $L_{540} : L_{620}$ for haemoglobin was 20·0 and for the dye 0·6.

Prior to making the actual plasma volume determinations, it is necessary to determine a calibration constant for the dye and colorimeter. This is done by making various known dilutions of dye in plasma embracing the range of concentrations expected to be encountered in the experimental procedure and determining the L value for each dilution. Each L value is divided by the concentration in mg. per 100 ml. to give a "K" value.

The mean of these values for a number of concentrations of dye is taken to be the K value for the dye. The K value for the dye used was found to be 25·045. The use of this calibra-

* Present address: Department of Animal Pathology, University of Kentucky.

tion constant enables the concentration of dye in a sample of plasma to be calculated from the formula $C = \frac{L}{K}$ where C represents dye concentration in mg. per 100 ml. The plasma volume (PV) is therefore, in ml., $PV = \frac{M}{C}$ or, $PV = \frac{MK}{L}$ where M represents mg. of dye injected.

Results

Plasma Volume

The use of a polyethylene catheter greatly facilitated the injection of dye solution and the frequent withdrawal of blood samples. No clotting occurred for a period of 10 hours during which the tubing was maintained in position and no phlebitis or sepsis supervened subsequently at the site of venipuncture.

Table I

Reference number of blood sample or dye injection	Time of dye injection or blood sample withdrawal	Haematocrit value of blood sample	Corrected L value of plasma sample
		%	
1 Sample	09·53	50	0
2 Injection	09·53	—	–
3 Sample	09·58	45	0·178
4 ,,	10·03	42	0·172
5 ,,	10·13	39	0·164
6 ,,	10·23	39	0·164
7 ,,	10·38	37	0·166
8 ,,	10·53	35	0·161
9 ,,	11·33	36	0·158
10 Injection	11·35	—	—
11 Sample	11·53	35	0·248
12 ,,	12·23	35	0·242
13 ,,	12·53	39	0·237
14 ,,	14·03	31	0·232
15 ,,	14·33	35	0·221
16 ,,	15·03	35	0·215
17 Injection	15·05	—	—
18 Sample	15·23	35	0·310
19 ,,	15·53	35	0·298
20 ,,	16·53	38	0·291
21 ,,	18·28	37	0·268
22 ,,	20·10	37	0·251

Showing times of dye injections and blood sample withdrawals, the haematocrit values of the blood samples and the corrected L values of the plasma samples.

Table I shows the times of dye injections and the times at which blood samples were taken, their haematocrit values, and the corrected L values of the plasma samples. Table II shows the results of three individual plasma volume determinations made following each of three dye injections. The disappearance rate of the dye was calculated according to the method of Price & Longmire (1942).

This method involves knowing the concentration of dye (L value) of the last sample of blood taken before the second injection of dye, L_{ddf}, the expected plasma volume, *i.e.*, the volume as determined from the first injection less blood removed in sampling, PV_{exp}, and the volume as calculated from the second injection, PV_{meas}. Unknown is the concentration of dye which would have been present in the last sample before the second injection of dye if no shifts of fluid into or out of the circulation had taken place between the first and second injections of dye, *i.e.*, if only physiologic dye disappearance had occurred. This value, L_x may be calculated from the formula

$$\frac{L_x}{L_{ddf}} = \frac{PV_{meas}}{PV_{exp}} \text{ or, } L_x = \frac{L_{ddf} \times PV_{meas}}{PV_{exp}}$$

Table II

Ref. No. of injection	Mg. dye injected M	K value of dye K	L value of extrapolation point less L value of sample taken immediately prior to injection	Formula for plasma volume estimation $\frac{MK}{L}$ = plasma volume (ml.)
2 (1st inj.)	173·64	25·045	0·168 – 0 = 0·168	$\frac{173·64 \times 25·045}{0·168} = 25,886$
10 (2nd inj.)	99·78	25·045	0·256 – 0·158 = 0·098	$\frac{99·78 \times 25·045}{0·098} = 25,501$
17 (3rd inj.)	108·43	25·045	0·320 – 0·215 = 0·105	$\frac{108·43 \times 25·045}{0·105} = 25,863$
Mean measured plasma volume in ml.				= 25,750

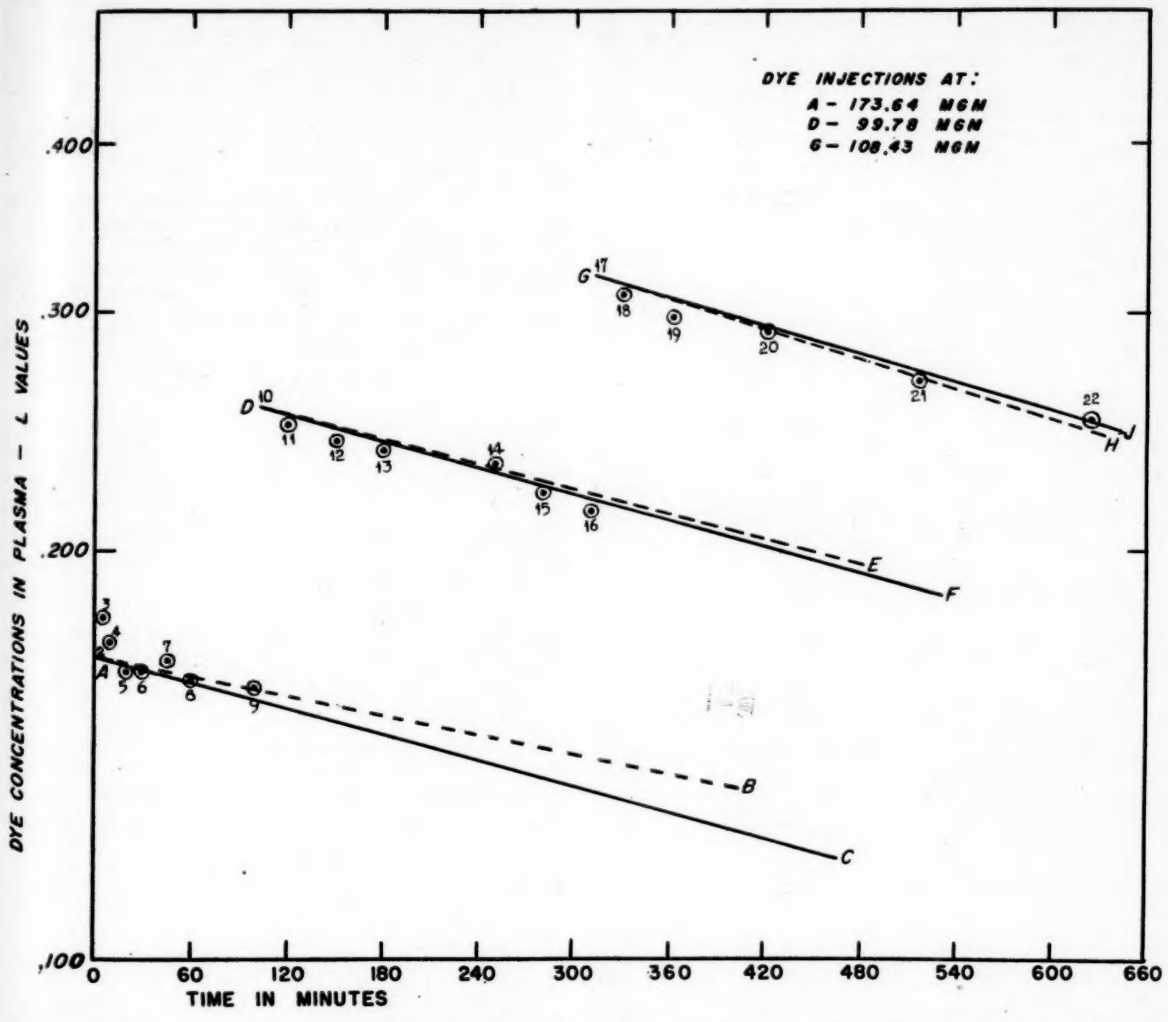
Showing three independent measurements of plasma volume based on three separate injections of dye and the mean of the three measurements. Reference numbers correspond with those given in Table I.

The concentrations of dye in the plasma samples (L values) are plotted against time in Fig. 1. The line AB represents concentration of dye/time following the first dye injection and the extrapolation of this line to the time of dye injection is made on the assumption that the high concentrations of dye shown by plasma samples taken shortly after injection are due to incomplete mixing of the dye in the plasma. Price & Longmire discuss the possible error in this extrapolation and as concluded by them and as will be shown in this paper, subsequent estimations confirm the accuracy of this extrapolation. The disappearance rate curve, AC, is drawn from the extrapolation point to the value obtained for L_x. Price & Longmire observed that in dogs the disappearance rate of dye remained constant in each individual for at least six to eight hours following injection and that the rate was a function of the total dye in the circulation. Fig. 1 also shows concentration of dye/time curves for the second and third injections, lines DE and GH respectively, and assuming a constant disappearance rate, disappearance rate curves for these injections, DF and GJ, drawn through the extrapolation points in each case parallel to the first disappearance rate curve AC. Continuing the use of Price & Longmire's calculations, step by step estimations of plasma volume are now made using the following formula :—

$$PV_x = PV_{exp} \times \frac{L_{dc}}{L_s}$$

where PV_x is the volume to be determined, PV_{exp} is the expected volume (*i.e.*, the volume calculated from the preceding injection or sample), L_{dc} is the L value of the *adjusted* disappearance curve at the time of sampling and L_s is the actual observed corrected L value of the sample. In making the calculation, the value L_{dc} is taken from a line parallel to the correct disappearance curve, passing through the actual corrected L value obtained for the preceding sample, since it is that amount of dye that is now undergoing disappearance at the established rate.

Table III shows these calculations, and the close agreement between measured, expected and calculated volumes indicates accuracy in the extrapolation of the concentration of dye/time curves and in the estimation of the disappearance rate of the dye. The disappearance rate calculated for the animal under test is equivalent to 4·37 per cent. per hour. The mean of the volumes independently estimated from the three dye injections is 25,750 ml. ; the mean of the expected volumes is 26,070 ml. and the mean of the calculated volumes is



26,104 ml. Statistical comparison of the means of the expected and calculated volumes gives a t value of 0·1111 and a value for P of 0·9+ indicating no significant differences whatever between the means. The mean of the closely agreeing measured, expected and calculated volumes is 25,975 ml. and this figure is taken as a reasonably accurate estimate of the average plasma volume in the horse under test. Since the animal weighed 496 kg., this volume represents a plasma volume of 52·37 ml. per kg. of bodyweight, a figure in close agreement with Courtice's estimate of 51·0 ml. per kg.

Blood Volume

A commonly used method of estimating blood volume from plasma volume is to use the formula

$$BV = \frac{PV \times 100}{100 - (\text{haematocrit} \times 0{\cdot}96)}$$

where BV represents total blood volume and PV represents plasma volume. This formula allows for 4 per cent. of dyed plasma trapped in the haematocrit red cell column (Price, Hanlon, Longmire & Metcalf, 1941). However, since the haematocrit may vary, this is not an accurate method of determining total blood volume. In the present investigation the haematocrit varied from 50 per cent. in the initial blood sample to 31 per cent., in sample 14. From this sample to sample 22 the haematocrit rose to 35 per cent. This initial drop in cell volume followed by a slow rise was also found to occur in human subjects undergoing plasma volume determinations by the dye method (Gibson & Evans, 1937). These authors averaged the haematocrits for all samples and used the mean value in calculating blood volume. Assuming the haematocrit of the initial blood sample (50 per cent.) to be unduly high owing to excitement of the animal, and omitting it from consideration, the mean haematocrit for all the remaining blood samples is 36·94 per cent. Using this figure and the formula given above, the total blood volume may be estimated tentatively from the plasma volume previously determined. The resulting figure is 40,247 ml., equivalent to 81·14 ml. of blood per kg. of bodyweight.

Discussion

The dye injection method described has proved simple to apply in the horse for the determination of plasma volume. The use of a polyethylene catheter in the jugular vein obviated frequent venipunctures and minimised excitement in the horse. Consequently large fluctuations in haematocrit were

Table III

Reference number of sample or injection	Measured plasma volume (ml.)	Expected volume calculated from preceding injection or sample (ml.)	L_{dc}/L_s	Calculated plasma volume (ml.)	Volume removed in sampling or added in injections (ml.)
1 Initial dye free blood sample			—	—	20
2 Ist injection of 173·64 mg. dye			—	—	20
3	25,886	—	—	—	20
4	—	—	—	—	20
5	—	25,846	0·166/0·164	26,161	20
6	—	26,141	0·163/0·164	25,982	20
7	—	25,862	0·165/0·166	25,806	20
8	—	25,786	0·163/0·161	26,106	20
9	—	26,086	0·156/0·158	25,756	20
10 2nd injection of 99·78 mg. dye			—	—	10
11	25,501	25,746	0·252/0·248	26,161	20
12	26,141	25,141	0·244/0·242	26,357	20
13	—	26,337	0·236/0·237	26,226	20
14	—	26,206	0·227/0·232	25,641	20
15	—	25,621	0·226/0·221	26,201	20
16	—	26,181	0·212/0·215	25,816	20
17 3rd injection of 108·43 mg. dye			—	—	10
18	25,863	25,806	0·315/0·310	26,222	20
19	—	26,202	0·304/0·298	26,730	20
20	—	26,710	0·285/0·291	26,159	20
21	—	26,139	0·269/0·268	26,236	20
22	—	26,216	0·250/0·251	26,111	20
Means	25 750	26,070	—	26,104	—

Mean of measured, calculated and expected volumes 25,975 ml.

Showing the computation of expected and calculated plasma volumes from each blood sample. No calculations are shown for the first two dyed samples since mixing of the dye in the plasma was incomplete at the times of sampling. Mean values for measured, expected and calculated volumes are given and a mean value for all three, the average plasma volume, is shown. The reference numbers correspond with those given in Table I.

avoided, an important point if total blood volume estimations are to be made. However, for total blood volume determinations the use of radioactive isotope methods to determine red cell volumes (Hahn *et al.*, 1942 ; Anderson, 1942) and the dye method for the determination of plasma volumes would appear to be the best procedure to obtain accurate results.

The results obtained for plasma volume in the animal used in the present experiments are in close agreement with earlier determinations made by the dye method (Courtice, 1943), but the tentative blood volume value is lower than that obtained by Reichert & Brown (1909), who used the Welcker wash-out method. These workers calculated a total blood volume of 97·0 ml. per kg. of bodyweight. This discrepancy is difficult to explain satisfactorily, but factors which are likely to be concerned are (*a*) the possibility of large error in total blood volume estimations based on plasma volumes and haematocrit values as already discussed and (*b*) the probability that in the wash-out method the large amount of red cells normally stored in the spleen of the horse may be included in the estimation, thus giving a higher figure for blood volume than those obtained by other methods. It seems evident that in horses, unless the radioactive isotope tagging method is used, it is impossible to determine accurately the absolute red cell volume and thus it is impossible to determine total blood volume. Tentative estimates of circulating blood volume may be made by the dye method, although the volume of circulating erythrocytes may vary depending on factors such as exercise or excitement and such estimates cannot include erythrocytes not in active circulation.

Summary

1. The application of the T-1824 blue dye method for plasma volume determination in the horse is described.

2. The results of plasma volume determinations in one animal are discussed.

3. A plasma volume of 5·237 per cent. of bodyweight found in this animal is in agreement with an earlier finding based on the dye method.

4. A tentative estimate of total blood volume in one animal of 8·114 per cent. of bodyweight is given and the sources of error in making the estimation are discussed.

Acknowledgments.—I desire to record my indebtedness to Professor Wm. C. Miller for much helpful criticism and advice. My thanks are due to Miss K. Butcher for considerable technical assistance and to Miss M. Elizabeth Wallace for the drawing of the figure.

References

Anderson, R. S. (1942). *Amer. J. Phys.* **137.** 359.

Courtice, F. C. (1943). *J. Physiol.* **102.** 290–305.

Dukes, H. H. (1942). "The Physiology of Domestic Animals." Fifth edition. Comstock Publishing Co., Ithaca, New York.

Gibson, J. G., & Evans, W. A. (1937). *J. Clin. Invest.* **16.** 301.
——— & Evelyn, K. A. (1938). *Ibid.* **17.** 153.

Gregersen, M. I., & Schiro, H. (1938). *Amer. J. Phys.* **121.** 284.

Hahn, P. F., Ross, J. F., Bale, W. F., Balfour, W. M., & Whipple, G. H. (1942). *J. Exp. Med.* **75.** 221.

Keith, N. M., Rowntree, L. C., & Geraghty, J. T. (1915). *Arch. Intern. Med.* **16.** 547.

Price, P. B., Hanlon, C. R., Longmire, W. P., & Metcalf, W. (1941). *Bull. Johns Hopkins Hosp.* **69.** 327.
——— & Longmire, W. P. (1942). *Ibid.* **71.** 51–84.

Reichert, E. T., & Brown, A. P. (1909). "The Crystallography of the Hemoglobins." Carnegie Inst., Washington.

PENICILLIN LEVELS IN COW'S MILK AFTER INTRAMAMMARY INFUSION OF PROCAINE PENICILLIN

BY

OLGA UVAROV,

AND

P. W. MUGGLETON,

Glaxo Laboratories, Ltd., Greenford, Middlesex

Introduction

It is now clear from the extensive literature on the treatment of bovine mastitis that penicillin is the antibiotic most widely used for that purpose. In view of this there is much interest both in the dose and in the frequency of administration needed for dealing with the common mammary infections.

The persistence of the antibiotic in milk after its intramammary infusion has been investigated by several workers, including Hughes *et al.* (1950), Hignett (1950) and Edwards & Haskins (1953). The form of penicillin has usually been the calcium, sodium or procaine salt, 100,000 unit doses being given at 48 to 72 hourly intervals. Hughes *et al.* (1950) showed that a 90 per cent. bacteriological clearance may be achieved in mastitis due to *Streptococcus agalactiae* by repeated infusions of procaine penicillin at 72-hour intervals.

In the work recorded here we measured the penicillin levels in the milk of cows that had received a single infusion of 300,000 units of procaine penicillin in a gel of mineral oil and aluminium stearate. The purpose of the investigation was to establish the persistence of penicillin levels adequate for coping with mammary infections due to penicillin-sensitive organisms.

Experimental

Procaine penicillin, 300,000 units in 3 ml. of mineral oil 3 per cent. aluminium stearate gel,* was infused into each quarter, via the teat canal, of each of six lactating cows. Foremilk samples were taken with aseptic precautions at intervals from the 3rd to the 18th day after the dose. The total milk yields of all cows were recorded daily.

Samples of foremilk, taken to the laboratory without delay, were assayed for penicillin within two hours. Penicillin estimations were made by plate bio-assay (in triplicate) with the test organism *Sarcina lutea*, strain CP1-1001, according to the method recommended for serum samples by the U.S. Food and Drugs Administration, Antibiotics Laboratory, Washington, D.C. Penicillin levels were calculated from inhibition zone diameters (Gaddum, 1953).

In order to check the accuracy of the method for estimating small amounts of penicillin in milk, standard amounts of penicillin were added to samples of normal cow's milk and titrated within two hours. The results (Table I) showed that the assay method used was sufficiently accurate for our purpose of measuring small amounts of penicillin in milk.

* "Procaine penicillin veterinary cerate, Glaxo."

Table I

Standard Penicillin Added to Normal Cow's Milk

Penicillin (I.U. per ml.)	
Added	Found
0·20	0·17
0·10	0·09
0·05	0·05
0	<0·01

The amounts of penicillin in the milk samples from the treated cows, together with their average milk yields, are shown in Table II. The average penicillin levels in the four quarters from all six cows, together with the largest and smallest average levels from individual cows, are illustrated in Fig. 1 (*overleaf*).

Discussion

After administering 300,000 units procaine penicillin in the gel, satisfactory levels of penicillin were found in the foremilk for periods up to 14 days, in all of the six cows in the test. Except for minor fluctuations, which could be generally related to daily fluctuations in milk yield, penicillin levels in

Table II

Average Milk Yields and Penicillin Foremilk Levels from Cows after Intramammary Infusion of Procaine Penicillin

Cow No.	Average milk yield (lb. per day)	Quarter	Penicillin levels in milk (I.U. per ml.) at (days) :— 3	4	5	6	7	8	10	14	18
1	45	R fore	0·55	0·24	0·11	0·10	0·08	0·08	0·19	0·05	0
		L „	0·41	0·20	0·19	0·13	0·19	0·16	0·06	0·03	0
		R hind	0·36	0·20	0·13	0·14	0·13	0·09	0·16	0·03	0
		L „	0·35	0·20	0·11	0·10	0·09	0·11	0·20	0·05	0
		Average :	0·42	0·21	0·14	0·12	0·12	0·10	0·15	0·04	0
2	45	R fore	0·85	0·42	0·23	0·19	0·41	0·27	0·49	0·14	0·09
		L „	0·98	0·47	0·23	0·20	0·67	0·20	0·43	0·09	0
		R hind	0·68	0·22	0·25	0·20	0·61	0·17	0·10	0·13	0
		L „	0·40	0·19	0·24	0·20	0·46	0·20	0·40	0·09	0·10
		Average :	0·73	0·33	0·24	0·20	0·54	0·21	0·25	0·11	0·05
3	43	R fore	0·31	0·25	0·20	0·11	0·22	0·27	0·15	0·11	0
		L „	0·18	0·19	0·14	0·21	0·17	0·14	0·11	0·05	0
		R hind	0·24	0·16	0·13	0·10	0·08	0·23	0·05	0·05	0
		L „	0·23	0·20	0·13	0·11	0·14	0·26	0·05	0·05	0
		Average :	0·24	0·20	0·15	0·13	0·15	0·23	0·09	0·07	0
4	43	R fore	0·49	0·39	0·17	0·11	0·15	0·15	0·06	0·12	0
		L „	0·22	0·36	0·20	0·11	0·20	0·11	0·06	0·12	0
		R hind	0·21	0·32	0·11	0·10	0·14	0·07	0·05	0·08	0
		L „	0·22	0·25	0·13	0·10	0·09	0·05	0·05	0·05	0
		Average :	0·29	0·33	0·15	0·11	0·15	0·10	0·06	0·09	0
5	12	R fore	1·50	1·26	0·59	0·39	0·49	0·26	0·28	0·08	0
		L „	1·50	1·20	0·62	0·44	0·40	0·32	0·34	0·13	0·03
		R hind	1·50	1·26	0·89	0·47	0·48	0·30	0·56	0·08	0
		L „	1·31	1·12	0·76	0·37	0·55	0·22	0·55	0·13	0
		Average :	1·45	1·21	0·72	0·42	0·48	0·28	0·43	0·11	0·01
6	10	R fore	1·50	1·26	1·17	0·87	0·75	0·29	0·05	0·19	0·06
		L „	1·50	1·26	1·54	1·23	0·94	0·78	1·00	0·60	0·05
		R hind	1·50	1·48	1·44	0·83	0·76	0·23	0·06	0·13	0
		L „	1·50	1·34	1·09	0·78	0·72	0·68	0·07	0·19	0·09
		Average :	1·50	1·34	1·30	0·93	0·79	0·50	0·30	0·28	0·05
Average of six cows, all quarters :			0·77	0·60	0·45	0·32	0·37	0·24	0·23	0·12	0·02

all six animals showed a steady decline over the observation period (3 to 18 days). Some traces remained in three of the cows up to the 18th day. Up to the eighth day the average penicillin level from the four quarters of all the six cows was

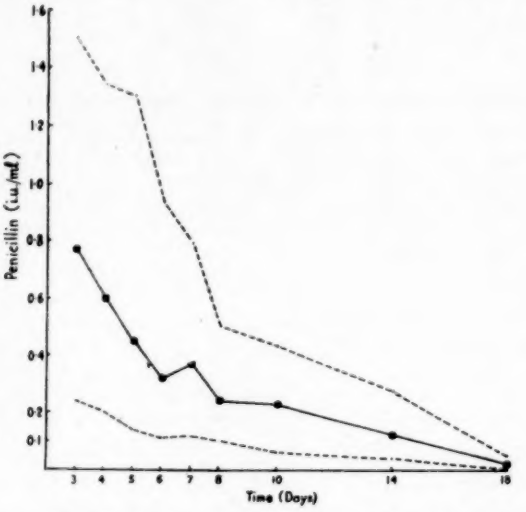


Fig. 1.—Penicillin levels in the milk of cows after intramammary infusion of procaine penicillin (300,000 units into each quarter).
●———● Average levels, all quarters from six cows.
— — — — Greatest and least levels recorded.

at least 0·1 I.U. per ml., sufficient to control the mastitis caused by most penicillin-sensitive organisms.

At earlier times (three to four days) levels of up to 1·0 I.U. per ml. were recorded, notably in the two animals with a lower milk yield. The negative correlation between milk yield and penicillin concentration (at times up to seven days) is in conformity with the observations of Murnane (1945) and Schalm & Casselberry (1946).

The results of this experiment with single infusions indicate that this type of therapy is likely to give a satisfactory treatment of bovine mastitis caused by penicillin-sensitive organisms. It may be that intractable cases will require further treatment and it is evident that additional doses, given at about seven-day intervals, will give sustained and adequate levels of penicillin.

Summary

Penicillin levels in the foremilk of cows have been investigated after intramammary infusion of 300,000 units of procaine penicillin in a gel of mineral oil and aluminium stearate.

Levels of over 0·1 I.U. per ml. were found for eight days and all six cows tested had detectable levels for at least 14 days after administration.

The magnitudes of the levels during the first seven days were found to vary inversely with the milk yields of the individual cows.

References

Edwards, S. J., & Haskins, M. D. (1953). *J. Comp. Path. & Therap.* **63**. 53.
Gaddum, J. H. (1953). *J. Pharm. & Pharmacol.* **6**. 345.
Hignett, S. L. (1950). *Vet. Rec.* **62**. 37.
Hughes, D. L., Christie, G. J., & Farmer, R. K. (1950). *Ibid.* **62**. 11.
Murnane, D. (1945). *Aust. Vet. J.* **21**. 82.
Schalm, O. W., & Casselberry, N. H. (1946). *J. Amer. Vet. Med. Ass.* **109**. 670.

CLINICAL COMMUNICATION

PERFORATING PEPTIC ULCERS IN A CAT WITH PERITONITIS AND PNEUMOPERITONEUM

W. F. H. JARRETT and D. D. LAWSON

University of Glasgow Veterinary School

According to Hutyra & Marek (1949), gastric ulcers in the domestic animals are rarely of clinical importance. They are said to be rare in the small animals, and when they do occur to have developed from acute erosions. The following case of chronic peptic ulcer in a cat is thought to be worth recording.

Subject.—Cat, female, aged 18 months.

History.—Eight months before admission to the hospital the animal had diarrhoea which eventually responded to sulphonamide therapy. Seven months later the cat became dull and showed extreme thirst. The appetite remained normal. Two weeks before admission diarrhoea recommenced and the animal vomited on one occasion only, the vomitus being blood tinged. Twelve days later the abdomen became swollen overnight; this was accompanied by respiratory embarrassment.

Clinical Findings.—The cat was admitted in a state of collapse. The pulse rate was 150, the respiratory rate 80 and the rectal temperature 102·8° F. There was no obvious abdominal tenderness on palpation, which revealed colonic distension. There was marked hyperresonance on percussion on the abdomen. Radiological examination revealed a spontaneous pneumoperitoneum and gaseous distension of the stomach and colon. The animal died shortly after admission.

Post-mortem Findings.—The thorax and thoracic organs were normal. The abdomen was grossly distended and tense, and on incision of the abdominal wall a large quantity of gas, under pressure, was released. This accounted for the greater part of the abdominal swelling. About 150 c.c. of free fluid was present in the abdomen. This was blood-tinged and contained many fine flecks of fibrin. The omentum, the mesentery, and the visceral surfaces of all the abdominal organs were covered with a thin layer of fibrin. This could be stripped off easily revealing a congested surface beneath.

The stomach was adherent anteriorly to the liver and posteriorly to the greater omentum. The gastric wall showed three perforations which corresponded to two ulcers on the mucosal surface. The ulcers were situated thus :—

1. On the lesser curvature, 2 inches from the cardia. This ulcer penetrated the mucosal and muscular coats directly and then tracked anteriorly and posteriorly over the serous coat to perforate at two places, *viz.*, on the anterior surface in contact with the liver, and on the posterior surface in contact with the omentum. Fibrous adhesions were present at both these sites.

2. One inch from the cardia on the right lateral wall. This ulcer perforated directly through the wall and was probably responsible for the diffuse peritonitis. Both ulcers were oval in shape and were 1 cm. long. They had firm smooth white rounded edges and dark red granular craters. At the point of adhesion to the liver there was a localised necrotising hepatitis. Considerable force was required to break down this adhesion; this left a necrotic crater in the liver.

There was no acute inflammatory change in the gastric mucosa. The duodenum was normal.

Microscopical Findings.—There was little evidence of any acute inflammatory reaction. The floor of the crater was lined by a thin layer of fibrinoid necrotic material. Immediately subjacent to these were a few small cellular foci of polymorphs and plasma cells, but this was nowhere marked.

Below this was a layer of active granulation tissue with large fleshy fibroblasts and some young capillaries. Subjacent to this was a layer of well-formed but cellular fibrous tissue. This process extended through, and completely replaced, the muscular coat of the part. The gastric epithelium overhung the ulcer crater laterally, and the newly formed fibrous tissue was undermining this epithelium laterally for a short distance.

The ulcers were identical to peptic ulcers as found in the human subject. In the latter, gastric ulcers are usually found 2 to 4 inches from the pylorus or at the pylorus ; other sites are rare. In this respect the feline condition differed from the corresponding human type.

SUMMARY

A case of chronic peptic ulcer in a cat is presented. Perforation had taken place, the sequelae being localised hepatitis, peritonitis and pneumoperitoneum. The ulcers were identical to the lesion seen in the human subject except in respect of their position.

REFERENCE

HUTYRA & MAREK "Special Pathology and Therapeutics of the Diseases of Domestic Animals." London.

ABSTRACTS

A Rapid Field Test for Contagious Bovine Pleuropneumonia*

The authors describe preliminary tests of a stained culture antigen for the detection of infected cattle in the field. The stained antigen is mixed with a drop of cattle blood on a slide and read directly; the general principles of the test are the same as the rapid antigen test for brucellosis and pullorum disease. The test is considered to be at least as satisfactory as the complement fixation test for diagnosis.

The original article should be consulted for the technical details of the preparation of the antigen.

D. L. H.

* **A Preliminary Report on a Rapid Field Test for Contagious Bovine Pleuropneumonia.** NEWING, C. R., & FIELD, A. C. (1953). *Brit. vet. J.* **109.** 397–404.

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A New Approach to Mastitis Therapy*

Working on the surgical principle that removal of inflammatory debris is the first requirement in the treatment of mastitis, Schipper has used the hormone oxytocin, for its milk ejection properties, the so-called " let down " action. It is claimed that its action results in maximum evacuation of infected secretion, and this can be followed by effective penetration of antibiotic treatment. After milking out the affected quarter, oxytocic principle was administered intravenously in doses between 10 and 40 units. (In the American preparation used each ml. contained 20 units of oxytocin and less than 0·4 units of pressor activity.) Twenty minutes later the quarter was again stripped out, following which the intramammary treatment of choice was given. Six case histories are given, two illustrate that oxytocin alone may have considerable activity in effecting clinical improvement in acute cases, two others were chronic cases also restored to normal milk production by oxytocin alone, and the last two cases are examples of oxytocin and antibiotic treatment combined.

D. L. H.

* **A New Approach to Mastitis Therapy.** SCHIPPER, I. A. (1953). *Vet. Med.* **48.** 401–404.

Eradication of Foot-and-Mouth Disease in Canada*

This is a most interesting description relating to the importation, identification and final eradication of foot-and-mouth disease from Canada.

The disease appeared in November, 1952, in swine on a farm in Saskatchewan 30 days after a German immigrant had left an infected farm in Western Germany. As foot-and-mouth disease had been unknown in the country for many years and infection revealed itself as an extremely mild form of stomatitis, a condition widely known in that region, no particular attention was paid to its existence. Response to treatment was good and recovery took place rapidly. However, the degree of spread encouraged more careful examination when a type A foot-and-mouth virus was identified. This led to a tracking down of the original case and suspicion was placed on the German immigrant. It appeared that when he left Germany foot-and-mouth disease of this type was present there and subsequently the virus was detected in the sausage meat he had brought with him, the skins of which had no doubt found their way into the garbage bins.

The measures of control are discussed in detail, including restriction of movement, quarantine, inspection and destruction of infected material. The formidable nature of the task will be realised when it is appreciated that the ground is frozen in winter to a depth of 6 feet and thawing by means of a flame thrower proved completely ineffectual. The disposal of carcases in small pits was impossible because the excavated clay remained in one solid lump, and it was only by the use of powerful mechanical appliances that deep pits were prepared and the infected and in-contact animals driven into them, shot and buried. The decontamination of premises again provided difficulties. Wet protective clothing froze almost immediately when exposed to outdoor conditions.

For the cleansing and disinfection of machinery 4 per cent. sodium carbonate solution was used, 2 per cent. of lye being employed for buildings, fences, posts, floors, etc. Premises were subsequently left free of livestock for 30 days, when two young cattle and two young pigs were introduced. If after 60 days there was no evidence of the disease the owner was allowed to re-stock.

Disinfection stations were established on all highways crossing the boundaries of the quarantine zones. This measure was done more to allay public alarm than because of any intrinsic value.

Whilst the initial outbreak occurred in November, 1952, the existence of foot-and-mouth disease was not publicly declared until the following February, when the total number of premises infected had reached 29. The total number of animals destroyed was 1,343 cattle, 293 swine, 97 sheep, 1 goat, 2,372 fowls, 5,828 eggs.

N. S. B.

* **Procedures Leading to Eradication of the First Outbreak of Foot-and-Mouth Disease in Canada.** CHILDS, T. (1953). *Proc. Part I, Int. Vet. Cong., Stockholm.* **1.** 217–223.

PIG FEEDING SURVEY

Observations are being made under the aegis of the Ministry of Agriculture to try to discover the national and county averages of the amount of meal fed for each pound of liveweight gain in fattening pigs, and to find out how far climatic conditions and housing affect the figures. Such figures are already available from various research centres, but it has now been decided that it would be useful to carry out observations on average farms. In Denmark the progeny testing stations have made even the smallest farms conscious of the importance of conversion rate, and it is hoped that when figures are forthcoming more farms in this country will be alive to the importance of this matter.

REPORT

[On the State of the Public Health. Report of the Ministry of Health for the year ended December 31st, 1952. The Annual Report of the Chief Medical Officer for the Year 1952. London: H.M.S.O. Price 6s. 6d.]

There are 15 sections and four appendices, and within them one may read the story of the efforts which are made for us to enjoy health—" Health is a form of harmony, in which the functions of the body and mind are free to exercise in unimpaired capacity."

The increased degree of control over certain of the communicable diseases, and the extending longevity of the population, is probably responsible for the changing pattern of mortality. In 1952 more than two-thirds of all deaths in England and Wales were attributed to " diseases of the circulatory system," " vascular lesions of the central nervous system " and " cancer." This is in marked contrast to 20 years ago when the proportion was less than half.

There are some parts of the report which are of direct interest to veterinary surgeons and this is especially so in the matter of food poisoning. Although it is remarked that " the gospel of kitchen hygiene has scarcely yet affected the practice of food handlers as a whole," the kinds of food which carry the bacterial causes and the types of organisms concerned are of professional interest. Bacteriological or epidemiological investigations showed that of 274 outbreaks or family outbreaks, 183 were associated with meat, 21 with eggs and eight with milk. In the 189 outbreaks where a causal agent was found, one was associated with whimberries stored overnight in a galvanised container from which some of the zinc had gone into solution; 117 were due to salmonellae, 44 to staphylococci, and 19 to *Cl. welchii*. Of the 21 outbreaks associated with eggs, 20 were associated with salmonellae and 19 of these with duck eggs. From 1949 to 1952 it can be said that " between 55 per cent. and 60 per cent. of all outbreaks, where the vehicle of infection was known, were due to processed and made-up meat." There is no evidence that the incidence of food poisoning is diminishing, and the safety of food depends upon the hygienic standards and sense of responsibility of the individual. The amount of food poisoning is an indication that the individual does not take his responsibilities in this matter seriously enough.

Human psittacosis is not a notifiable disease but during 1952 52 cases of infection with this group of viruses were diagnosed serologically at the Virus Reference Laboratory, Colindale. Thirty-seven gave a history of contact with birds, and the ban on imported parrots was re-introduced by the Ministry of Agriculture and Fisheries in February, 1953; the importation of parrots and other birds of the psittaciformes had been permitted from January, 1952.

There are 58 districts in which the Medical Officer of Health requires to be notified of cases of anthrax in man, whilst in other districts it is customary for the attending practitioner to inform the local Medical Officer of Health. During 1952 there had been a reported increase in the incidence of the disease in animals but not in man; notwithstanding this there is a brief account given of the danger to man especially from some samples of imported bones which are manufactured into animal feeding-stuffs, gelatine and fertilisers.

Veterinary surgeons are interested in the effects of fog and other climatic disturbances upon health, and the official statement quoted herewith, precedes a discussion on the London fog, December 5th to 8th, 1952. " The number of deaths over and above those usually expected in the first three weeks of December indicated that between 3,500 and 4,000 people may have died as a result of the fog." This abrupt rise in mortality was not experienced in other parts of the country, and there was a very short interval between the onset of the fog and the beginning of the rise in the number of deaths. The victims died rapidly and many of them had already some form of chronic chest disease. It is thought that a combination of a number of toxic and irritating substance in the polluted atmosphere, rather than one toxic substances, was responsible.

It is clear that *R. burneti,* the causal organism of Q fever, is widespread among cattle in this country, though it gives rise to little or no manifest disease. The organism is excreted in the milk, which, if drunk in the raw state, may give rise to disease in human beings.

Trichinosis existed in the pigs and rats on some farms in Pembrokeshire and this was revealed because of the small outbreak of the disease in people who had eaten some pork sausages in that area.

The complexity of the problem of cancer is recognised and the study of mammary cancer in the mouse shows that a genetic susceptibility, a hormone and a factor which may be a virus may all be involved. The relationship between nucleo-proteins and cancer viruses has been partially clarified and it is now thought that mutations in the cell caused by chemical carcinogens do not exclude nor contradict the virus hypothesis. The statistical approach shows the possible association between smoking and cancer of the lung, and although there is much talk about it to-day, it is interesting that in 1952 it was thought that the evidence " is, in the Committee's opinion, insufficient to justify propaganda."

Different methods of approach are made to elucidate and understand many of the problems of nutrition; haemoglobin surveys are made on blood donors and factory workers; the correlation between body fat and cholinesterase levels in plasma has been established; the association between diet and energy is also being studied in some detail. The processing of food which may involve the addition of chemical substances receives some consideration, and the Ministry are not unmindful of the possibility of gradual accumulation of some substances as a result of lifelong consumption.

Dental health, mental health, the importance of seaport and airport health services, nursing, and international health are included in the report. Throughout the pages of the document, which is by no means dull, there is the insistence of " healthy habits of life on the part of the individual " and the foundation of the public health upon sound environmental sanitation.

R. L.

UNREGISTERED PRACTITIONER FINED

For practising as a veterinary surgeon when he was not qualified to do so, Mr. John Roberts, of Leicester, was recently fined £10 by the local Bench. He pleaded not guilty. It was stated in evidence that Mr. Roberts endeavoured to diagnose illness in a dog and to prescribe for it; for the defence, however, it was said that he only examined the dog to oblige a friend and that the fee he was said to have received was a tip.

REVIEWS

[**Canine Medicine.** Edited by H. Preston Hoskins, v.m.d., J. A. Lacroix, d.v.s., & Carl Mayer, b.s., d.v.m. 614 pp. Illustrated. Published by American Veterinary Publications, Inc., Evanston, Illinois, 1953. Price approximately £4 16s.]

Adequately to review a work of this magnitude and yet not unduly to delay such notice is not an easy task. "Canine Medicine" is a companion volume to the now famous "Canine Surgery" and like it is the work of a symposium of authors, in this case 40 in number. It is a book of some 600 pages and is copiously illustrated.

Introductory sections comprise a chapter on clinical examinations, one on administration of medicines, and another on nutrition. This is followed by chapters devoted to diseases of the various systems and organs of the body, and subsequently by a consideration of specific diseases grouped under aetiological headings, *e.g.*, mycotic diseases, viral diseases, etc.

The book concludes with a most interesting chapter on gerontology, a chapter on euthanasia (at first sight rather startling, until one realises the author has exceeded his terms of reference by including other small animals than the dog!), and finally one on inhalation therapy which is both novel, interesting and informative.

Detailed criticism is not called for on this occasion, although there are unfortunately a number of points on which we should like to cross swords with the respective authors.

Broader criticisms we venture are as follows:—

The title of the book and its relation to its companion volume "Canine Surgery" led us to expect the text to be virtually confined to purely medical conditions and treatments, with only brief cross reference to surgical measures when necessary. Yet in several sections much space is devoted to conditions we would assuredly classify as surgical, and to remedial measures which are most emphatically not medical.

There is considerable lack of uniformity in the approach to various subjects. For example, in some instances there is a large introductory section on the physiology and normal chemistry of the organs or tissues to be discussed, yet in others the reader is plunged direct into a list of disease conditions with no such introduction.

Again, some sections have been given space which seems to us out of all proportion to the relative importance of the subjects; a striking example is the chapter of 48 pages on the blood and blood-forming organs (not including the heart), as compared with a meagre 24 pages on viral diseases (rabies receiving separate attention), a disproportion which will strike most forcibly the clinician who knows full well how many cases of virus infection he meets as compared with diseases of the blood.

The book lacks clarity in its clinical descriptions. In no case has the symptomatology described conveyed to us a word picture of any condition or group of conditions; symptoms and signs enumerated are often vague and there is little indication of their relative importance.

"Canine Medicine" is described as a text and reference book, yet we feel that few students or inexperienced clinicians turning to it for assistance will find their diagnosis materially aided from its text. There is an irritating tendency in many sections for obscure disease entities to be discussed at some length, only to find in the concluding paragraph some statement to the effect that this condition has not yet been met or proved to exist in the dog! Extremely confusing to the inexperienced.

Neither did we expect a book on therapeutics, but treatment must surely be an integral part of medicine, and these sections leave us with the same feeling of vagueness as the symptomatology. Too many generalities are included, *e.g.*, "female sex hormones," "antibiotics," with no indication as to which of these in the authors' opinion is the agent of choice, an opinion which, from an experienced clinician, can be most valuable.

To the experienced and up-to-date clinician, however, the book has much to offer. Its main value is as a work of reference. Here we have in compact form discussions on almost every canine ailment; in most chapters the literature is reviewed (in too many instances the references are in the American style, far too parochial), each disease is dealt with from several angles, mainly physiological and pathological, but for those practitioners who are confident diagnosticians and have a sound knowledge of therapeutics the matter herein will provide a satisfying background.

Production is good, the print is clear and the great majority of illustrations are worth while; we have to admit, however, that we have studied some of the photographs with great care and have failed to find them helpful, particularly some of those purporting to illustrate certain skin conditions.

We recommend "Canine Medicine" to all established small-animal clinicians and predict that they will find much stimulation within its covers, in fact for such readers it is virtually a "must." To the student we commend it only for most careful and discriminating study, as a source of information to be used only to superimpose upon really sound clinical teaching in fundamentals of diagnosis and therapeutics. Although not expensive for what it is, "Canine Medicine" is none the less not cheap, thus students and young graduates will probably defer its purchase, making use of it through library facilities meanwhile.

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[**Popular Pet Keeping.** (1953). P. M. Soderberg. Pp. 190. Andrew George Elliot. Price 6s.]

"Popular Pet Keeping," by P. M. Soderberg, is one of a series of books known as Right Way Books, which are published by Mr. Andrew George Elliot, of Kingswood, Surrey. Mr. Elliot encourages amateur authors to write books on their particular subjects. Thus it would be unfair to expect this particular edition to be scientific, and I feel that Mr. Elliot, as publisher, would be the first person to state that this was never the intention. Without doubt, as an amateur's reference guide, "Popular Pet Keeping" gives a lot of sensible and practical information about guinea-pigs, fish, hamsters, mice, pigeons, rabbits, reptiles and amphibians. The author details the common breeds of these species and explains the necessities of housing and feeding. Wisely he keeps off diseases, and leaves these to the veterinary surgeon.

It would be difficult to disagree with any of the subject matter in the book, since it is all so general. I confess I have a personal dislike of line drawings when I feel that photographs are so much better; but doubtless the cost of reproduction made it impossible to employ this system in this particular type of book. The artist, L. R. Brightwell, is very well known for animal illustrations, but I feel in this book he has not excelled himself. Possibly this is due to the method of reproduction. Equally, the paper on which the book is printed leaves much to be desired, but at the same time it must be borne in mind that this most useful little handbook costs only 6s.

QUESTIONS AND ANSWERS

The submission of questions for inclusion in this column is welcomed; they can relate to any aspect of veterinary work, but must be of a general nature—questions cannot be considered in which information is sought regarding diagnosis or treatment of specific cases, nor for which solely a private reply is desired. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Examining Animals for Insurance

Q. 447.—*What are the important points to be considered when examining an animal for purposes of insurance?*

A.—The first point for consideration when examining an animal for insurance is that the certificate should give a true picture that will enable underwriters to assess the risk, and to this end all abnormalities should be noted. Insurers retain the services of a veterinary surgeon to explain the significance of such defects and their possible impact on the risk.

The actual certificate should note (where possible) that a horse, for example, is free from signs of contagious disease and previous injury or operation, is sound in wind, limb, and eyes, and that the heart was auscultated before and after exercise and found to be normal. It should be remembered that lack of disclosure by the owner or his agent (the veterinary surgeon) can invalidate the policy; and the veterinary surgeon is well advised to add, where possible, " I am informed by the owner that this animal has shown no deviation from normal during the past 12 months."

As regards other livestock, they should be certified as to bodily condition and freedom from contagious disease, with a note of any test or vaccination carried out during the previous 12 months.

It may not be inappropriate to remind the profession that a certificate signed by a veterinary surgeon is in the nature of an affidavit, a document he may be called upon to prove in any legal proceedings that may ensue.

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Artificial Rearing of Young Pigs

Q. 448.—*Would you please detail a method of artificially rearing young pigs from a day old to weaning, with details of feeding (probably with cows' milk as a basis), temperature of feed, and the temperature at which the " nest " should be kept.*

I have always found that little pigs do quite well for just a few days and then start dying after about a week of artificial feeding.

A.—(*Part I*). The nest can be made of a square of bales, or in any draught-proof small shed. Heating is best provided by an infra-red lamp, hung at a distance of 3 feet 6 inches from the floor; a lamp too low burns the ear tips and soon gives the piglets a half-baked appearance. Bedding should be short straw, or even chaff.

The writer considers that the under-mentioned mixture is satisfactory and prefers to supply this in a shallow tin such as a baking dish of not more than 1½ inches in depth. This should be placed on a clean heavy sack to prevent bedding from being trampled into the dish, the latter to be placed just under the arc of the lamp. A cobble-stone placed in the dish prevents it from being tipped up should a little pig stand on the rim. The little pigs quickly learn to drink out of the tin. Litters fed on cows' milk generally die after about five to seven days and therefore we made some alteration to it. The mixture at the moment is:—

One pint cows' milk One-third pint lime water One tablespoonful glucose Ten drops cod-liver oil Ten grains sodium citrate	} in each feed

The above will be sufficient for eight pigs at each feed for three or four days. They will then require one and a half or twice the above quantities.

It is all important that meal times should be at very regular intervals. The bellies of hand-reared pigs are very reliable clocks, and in a day or two they begin to squeal when the need for the next meal is felt. They should be fed five times daily, but not at night, and the temperature of the mixture should be approximately 104° F.

(*Part II*).—If the sow was affected with any septic condition, *i.e.*, mastitis or pyometritis, a sprinkling of Glaxo penicillin granules should be added to each feed for the first four days of artificial feeding. If no septic condition was present the addition of granular penicillin is better delayed until about the 10th day. Should any scouring appear a small quantity of ferrum redactum should be added to each feed. At 14 days a small trough of pig starter meal, with or without penicillin premix, should be introduced, so that they can feed from it at will. Also, one feed should be thickened with thin porridge. At about three and a half weeks the milk can be gradually stopped, depending on how well they are taking the meal. At this age the pigs are slightly smaller than normal well-reared pigs, but the difference in size lessens each week.

REFERENCE

TEBBUTT, N. F. (1953). *Vet. Rec.* **65**. 416.

(This article is not quoted in the above answer, but as it is upon the same subject we beg to draw our readers' attention to it.)

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Home-produced Cod-liver Oil

Q. 449.—*A client makes his own " cod-liver oil " for his pigs by boiling cod livers and collecting the fluid. I am unable to decide on the value of this product with regard to vitamin A and any other factors. Could you help me? The sows which are fed with food containing this " cod-liver oil " are coming on heat three weeks after farrowing whilst suckling a litter, a fact which the owner considers unusual. He is also using this product with marked success on piglets unable to stand.*

A.—So long as the cod livers are not boiled for an exceptionally long period, and not under pressure, there should be little deterioration of the vitamin A and D content. The amount of these vitamins in the extract will depend entirely upon the efficiency of the process employed. As the vitamin A is related to the fat, the amount present will be in proportion to the amount of fat extracted. It is recommended that an assay be made on a suitable sample.

The onset of oestrus during suckling is more common than is generally recognised. Observations by Burger* showed that between 15 and 20 per cent. of Large Whites came into season between the 30th and 60th hour after farrowing, and a slightly higher percentage of Large Blacks. Mating at this time was, however, invariably unsuccessful. It is less common for oestrus to appear at three weeks after farrowing and it can only be assumed that the addition of the " cod-liver oil " extract has a stimulating effect upon the pituitary. The success which is reported in bringing piglets back on to their feet suggests that the preparation does, in fact, contain a fair quantity of vitamin A.

* *The Onderstepoort Journal of Veterinary Research*, September, 1952, page 71.

"Spraying" in Cats

Q. 450.—*Five neutered cats live in one home; two females, seven and five years old neutered as kittens, and three males, five, three and a half and three years old. The three-and-a-half-year-old was neutered when two years old and the others as kittens.*

About a month ago, two of the neutered males—those three and a half and three years old—for no apparent reason commenced "spraying" (standing and emitting urine against curtains, walls, chairs, etc.). All the cats are perfectly well, and the two culprits show no signs of any abnormality or diseased condition. After a course of urinary sedatives, since this objectionable habit occurs in some males and castration appears to be always a complete answer, stilboestrol has been tried with no effect on the "spraying"; but the two patients collected a string of male followers.

The owner does not wish to part with the cats, but the furnishings are being damaged, and the house made objectionable, though the urine does not give off as much smell as would be the case with an uncastrated tom.

A.—Although the habit of "spraying" is usually encountered in the entire male cat and is therefore associated with sexual display, the respondent has also met the condition in neutered males and believes that emotional causes other than sex may give rise to the habit.

In one case resentment or jealousy at the introduction of another cat started the vice in a neutered Siamese, and although the question suggests that no such cause exists in the cases cited it might be well to consider whether there has been any change in routine or surroundings (new carpets, furniture, etc.) which may have aroused resentment. Mild sedation by bromides or even very small doses of phenobarbitone would be worth a trial since in the writer's view the cause is not a physical one.

IN PARLIAMENT

Slaughterhouses Bill

In the House of Lords Lord Woolton, in introducing the Slaughterhouses Bill, said: "I beg leave to introduce a Slaughterhouses Bill to make local authorities responsible for the time being for securing that adequate slaughterhouse facilities are available locally; to explain and amend the law with respect to the provision by local authorities of public slaughterhouses, the making of charges in respect of such slaughterhouses, and the grant and renewal of licences under Section 57 of the Food and Drugs Act, 1938; to make further provision with respect to the regulation and restriction of private slaughterhouses, and the payment of compensation where a licence or registration in respect of such a slaughterhouse is refused or ceases to be in force; and for purposes connected with the matters aforesaid. I beg to move that this Bill be read a first time."

It was agreed that the Bill be read, and printed.

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The Earl of Home, Minister of State for Scotland (March 25th), moved the second reading of the Slaughterhouses Bill. He said that its purpose was to provide legislation for ensuring that when meat was decontrolled the slaughtering of livestock and the distribution of meat should proceed smoothly. When control ended many more slaughterhouses would be needed in England and Wales. It was the Government's intention to bring about a moderate concentration of slaughtering facilities in a few hundred slaughterhouses, and the new premises which they had built had been sited to fit into a long-term siting plan. To ensure that sufficient slaughtering facilities would be available when control ended, local authorities had already been asked to start consultation with the organisations representing farmers and meat traders in their districts, and the duty would be laid upon the authorities to secure the provision of the necessary additional facilities.

Lord Silkin protested against the inadequate time given to the Opposition to consider this important measure. It would be better to postpone decontrol and to ensure that satisfactory facilities for slaughtering of livestock were available than to carry it out with inadequate and unsatisfactory conditions.

Lord Chesham said that this was not a hasty piece of legislation, but a clever, well-thought-out Bill, aimed at securing the best from whatever source it was available. Efficient slaughtering would be promoted.

Lord Burden asked why the Government were employing rush tactics and treating their lordships with scant courtesy. In some respects the Bill was retrograde and reactionary. It flouted the painstaking work of the Ministry of Food officers, which was being thrown away by this dash for freedom.

Panic Legislation

Lord Lucas said that as a piece of panic legislation and ill-thought legislation this Bill was a fair example, and as a piece of economic planning it did not add up to sense. The Government had not the first idea about a policy for livestock marketing. All they had thought about had been a dash for freedom, and everything else, whether in the national interest or not, was to be sacrificed to that. The only thing that was certain was that the price of good quality meat would be increased because the cost of operating the system would be so high.

Lord Saltoun said that the Opposition had not done much to damage the Bill. Their arguments were inconsistent.

The Earl of Home said that the Government had no intention of being discourteous to the House. They had seen the chance to de-ration meat this year and it was a public duty to take that chance, although it meant a hurried measure. The new hygiene regulations were being prepared and when applied would be operated by the local authorities under Section 8 of the 1938 Food and Drugs Act. It was estimated that after decontrol 3,000 to 3,500 slaughterhouses would be needed in the United Kingdom.

The Bill was read a second time.

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Questions

Slaughterhouses

Captain Duncan (March 23rd) asked the Secretary of State for Scotland (1) what action he has taken on the interim report of the Inter-Departmental Committee on Slaughterhouses (Scotland); and whether he has issued guidance to local authorities on the subject;

(2) what legislative action he proposes to take to implement the recommendations of the Inter-Departmental Committee on Slaughterhouses (Scotland) so as to ensure that the new powers for local authorities will be in operation before the decontrol of meat.

Commander Galbraith: A Bill has been introduced in another place to give effect to the recommendations in the Committee's Interim Report. My right hon. Friend is in touch with the Scottish local authorities on the matter.

Captain Duncan: Has my right hon. and gallant Friend circularised local authorities, meat traders and farmers in accordance with paragraph 29 of the Interim Report so that there shall be close consultation with a view to the provision of adequate slaughtering facilities in the export areas?

Commander Galbraith: A circular has been issued to the local authorities.

Mr. Grimond asked the Secretary of State for Scotland for a statement on the siting of slaughterhouses in Scotland.

Commander Galbraith: The Scottish Committee on Slaughterhouses are still considering the long-term problem. Recently they submitted an Interim Report on the arrangements necessary to ensure a satisfactory slaughtering service when meat is decontrolled this summer; and a Bill has been introduced in another place giving effect to their recommendations.

Mr. Grimond: Since the solution of the long-term problem of slaughtering is of great importance in connection with the marketing of meat, can the right hon. and gallant Gentleman say when the Government hope to be able to give some indication how far they will go in arranging for beasts to be slaughtered locally?

Commander Galbraith: The hon. Gentleman had better await the Report of the Committee. As he says, it is an important matter, and we ought to give the Committee adequate time to consider what improvements are necessary.

Mr. Thornton-Kemsley: Is my right hon. and gallant Friend satisfied that sufficient slaughterhouse facilities will be available in Scotland in July of this year?

Commander Galbraith: We believe that that will be the case.

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Gin Traps

Sir T. Moore (March 23rd) asked the Secretary of State for Scotland whether his attention has been called to the case of the golden eagle which plunged into Loch Ness and was drowned, with a steel-toothed trap, from which it had been unable to free itself, dangling from one of its legs; and if he will ban the use of steel-toothed traps at the earliest possible moment.

The Joint Under-Secretary of State for Scotland (Mr. McNair Snadden): I have seen Press reports of the incident. Pending the enactment of the Pests Bill, now under consideration in another place, my right hon. Friend has no power to impose a ban on the general use of the gin trap.

Sir T. Moore: Does my hon. Friend appreciate that this trap must have been laid in the open and must, therefore, have infringed the law, because no great bird like this could possibly have got into a burrow? Will he take steps at the earliest possible moment to ensure that these great and unusual birds are safeguarded just as other animals are?

Mr. Snadden: Under the Wild Birds Protection Act it is an offence to lay a trap in the open to catch birds.

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Licensing of Bulls in Scotland

Mr. Baldwin (March 25th) asked the Secretary of State for Scotland whether he is aware of the unsatisfactory position which has arisen owing to the action of the veterinary officers of the Scottish Department of Agriculture in delicensing bulls after arrival in Scotland, in spite of the fact that they have already been licensed by inspectors of the Ministry of Agriculture; and what action he proposes to take following the protests made by the National Cattle Breeders' Association representing all breeds to the effect that bulls licensed in England or Scotland should not be subjected to further inspection.

Mr. J. Stuart: I am aware of the position, and I have taken note of the recent representations made by the National Cattle Breeders' Association. I propose to review the present arrangements for licensing after I have had an opportunity of consulting further with the Scottish Licensing of Bulls Advisory Committee when they meet next month.

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Regulations for Exportation of Cattle

Mr. Cooper-Key (March 25th) asked the Minister of Agriculture whether he is aware that the exportation of cattle to certain countries, especially the United States of America, is being impeded by existing regulations; and whether he will take steps to ensure that this important section of the industry should be given the opportunity to expand.

Sir T. Dugdale: I am not aware of any regulation in this country which is impeding the export of cattle. I should be willing to draw the attention of overseas Governments to any veterinary import regulations which appeared unduly stringent, but in the particular case about which my hon. Friend has written to me I do not think that such an approach would serve any useful purpose.

NOTES AND NEWS

Diary of Events

Apr. 7th.—Ordinary Meeting of the Association of Veterinary Teachers and Research Workers (Northern Region) in the Department of Veterinary Pathology, Bedford Street North, Liverpool, 7, at 10.30 a.m.

Apr. 7th.—Meeting of the Editorial Committee, B.V.A., at 7, Mansfield Street, W.1, 2.30 p.m.

Apr. 8th.—All-day Meeting of the Central Division, B.V.A., at the Royal Veterinary College, Camden Town, N.W.1, 10.30 a.m.

Apr. 9th.—Meeting of the Biochemical Society in the Department of Biochemistry, University New Buildings, Edinburgh, 8, at 11 a.m.

Apr. 10th.—Reunion Dinner of the R.V.C. '52 Club at "Ye Miller of Mansfield," Streatley, 7.30 p.m.

Apr. 11th.—Joint meeting of the South-East Midlands Division, B.V.A., and the Kettering and District Medical Association at Kettering General Hospital, 7 p.m.

Apr. 15th.—General Meeting of the Hertfordshire and Bedfordshire Division, B.V.A., at 78, Holywell Hill, St. Albans, 7.30 p.m.

Apr. 21st.—Meeting of the Royal Society of Medicine, Section of Comparative Medicine, at 1, Wimpole Street, London, W.1, 5 p.m.

Apr. 21st.—Ordinary Meeting of the Royal Microscopical Society at Tavistock House South, Tavistock Square, London, W.C.1, 5.30 p.m.

Apr. 23rd.—General Meeting of the Midland Counties Division, B.V.A., at the Star Hotel, Worcester, 2.30 p.m.

Apr. 28th.—Meeting of the Lancashire Division, B.V.A., at the Midland Hotel, Manchester, 2.30 p.m.

May 1st.—Annual General Meeting of the Association of State Veterinary Officers in the Auditorium of the Wellcome Research Institute, 183-193, Euston Road, London, N.W.1, 2 p.m.

May 6th.—A symposium on "The Design of Animal Houses" at the Royal Society of Medicine, 1, Wimpole Street, London, W.1, 10.45 a.m.

Sept. 19th—25th.—72nd Annual General Meeting and Congress of the British Veterinary Association at Torquay.

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B.V.A. Council and Committee Meetings at the University of Glasgow

Monday, April 12th

10.30 a.m. Veterinary State Medicine Committee.
2.15 p.m. Home Appointments Committee.
3.30 p.m. Parliamentary and Public Relations Committee.

Tuesday, April 13th

10.30 a.m. Organising Committee.
1.45 p.m. General Purposes and Finance Committee.

Wednesday, April 14th

10.0 a.m. Council Meeting.

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PERSONAL

Birth.—Daykin.—On February 24th, 1954, to Elizabeth, wife of P. W. Daykin, B.Sc., M.R.C.V.S., a daughter—Anne Catherine Elizabeth.

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R.C.V.S. OBITUARY

Buckingham, John, "Edgehurst," Station Road, Harleston, Norfolk. Graduated London, July 13th, 1898. Died March 22nd, 1954; aged 78 years.

CLERK, Dugaid, of 3, Bath Street, Stonehaven, Kincardineshire. Graduated Glasgow, December 23rd, 1890. Died March 21st, 1954; aged 89 years.

DONALDSON, James (Captain late R.A.V.C.), "Hilbride," 2, Sandringham Road, Penn, Wolverhampton, Staffs. Graduated Glasgow, December 18th, 1897. Died suddenly March 27th, 1954; aged 79 years.

MURRAY, Charles Allison, C.B.E. (Brigadier A.V. & R.S., retd., and Colonel Commandant, R.A.V.C., retd.), of Dalehurst, Effingham, Surrey. Graduated Dublin, July 21st, 1908. Died March 27th, 1954.

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John Buckingham, M.R.C.V.S.

We have learned with deep regret of the death of Mr. John Buckingham, of Harleston, who was well known in all parts of South Norfolk and North Suffolk. He was a member of the Eastern Counties Veterinary Society for many years and was recently honoured by the Division by being elected an honorary member.

After qualifying at the Royal Veterinary College in 1898, John Buckingham practised at Harleston with his father, but on the death of John Buckingham, senior, he went into partnership with his brother. The partnership was subsequently dissolved, but John Buckingham remained in Harleston, where he held appointments as an Inspector under the Norfolk County Council and, latterly, under the Ministry of Agriculture. He had also acted as a referee at local and county agricultural shows, and once, in December, 1909, he had performed an operation on a circus lion at Harleston saleyard.

Mr. Buckingham was a keen sportsman and had been a member of Harleston Magpie and the former Swan Bowling Clubs.

He leaves a widow, three sons and a daughter; his eldest son, Mr. J. Leonard Buckingham, M.R.C.V.S., holds a Ministry appointment at Shrewsbury. To them and to all his family we extend our deepest sympathy.

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Brigadier C. A. Murray, C.B.E., M.R.C.V.S.

The funeral of the late Brigadier C. A. Murray took place at the Church of Our Lady of Sorrows, Effingham, Surrey, on Wednesday, March 31st. The bearer party consisted of eight N.C.O.s and warrant officers of the R.A.V.C., and the Last Post was sounded by trumpeters of the King's Troop, Royal Horse Artillery.

The War Office was represented by Brigadier A. G. Heveningham, M.R.C.V.S., Director of the Army Veterinary and Remount Services, and Colonel C. Holland, M.R.C.V.S., D.V.S.M. Brigadier J. J. Plunkett, M.R.C.V.S. (Colonel Commandant, R.A.V.C.), Colonel J. Clabby, of the R.A.V.C. Training Depot, and Brigadier G. A. Kelly were among those present. Mr. J. K. Bateman represented the British Veterinary Association.

We hope to publish an appreciation of Brigadier Murray's life and work in an early issue of *The Veterinary Record*.

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MILK MARKETING BOARD APPOINTMENTS

At the last meeting of the Milk Marketing Board Mr. J. L. Davies was appointed Chief Manager, and Mr. C. R. Garnham, Chief Executive Officer. These appointments took effect on April 1st. Dr. Joseph Edwards continues as Chief of the Production Division and Scientific Officer to the Board. With the restoration of its old marketing powers and fresh responsibilities arising from present conditions a new chapter in the work of the Board is about to open. Controls in the milk industry having been in operation for 15 years, a considerable task lies ahead. While the production of milk continues to rise, its consumption is falling; a "Drink More Milk" campaign, therefore, will be launched, and endeavours will be made in other directions to make the best use of all available supplies.

TO STUDY MEAT INSPECTION

A delegation organised by the B.V.A. will shortly be leaving this country to visit a number of abattoirs in Western Europe, in order to study methods of meat inspection as they are carried out on the Continent.

Members of the delegation will be Mr. A. J. Champion, M.P., Mr. Robert Crouch, M.P., Mr. Horace Thornton, B.V.Sc., M.R.C.V.S., D.V.H., Chief Veterinary Inspector, City and County of Newcastle upon Tyne, and Dr. W. R. Wooldridge, M.Sc., M.R.C.V.S., Scientific Director of the Animal Health Trust.

The places to be visited will include Rotterdam, Hamburg, Paris, Madrid and Copenhagen.

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LABORATORY ANIMALS BUREAU CONGRESS

The 1954 Congress of the Laboratory Animals Bureau will be held at Sheffield University on Monday and Tuesday, April 5th and 6th. Papers on a wide variety of subjects will be read, including "Animal House Management" by Mr. W. H. Lowe, of Sheffield University, "The Life Cycle of Some Common Parasitic Helminths of Laboratory Animals" by Mr. G. H. Cushnie, of the Rowett Research Institute, "The Design and Management of Animal Colonies in Radiobiological Research" by Mr. R. T. Charles, of Pollards Wood Research Station, "Hygiene" by Mr. T. Badger, of The Wellcome Veterinary Research Station, and "The Management of Laboratory Animals and its Influence on the Incidence of Disease" by Mr. J. O. L. King, of the University of Liverpool Field Station.

At 5.45 p.m. on April 5th the annual general meeting of the Animal Technicians Association will take place, and on both days of the Congress there will be programmes of scientific films and visits to such places of interest as the Public Health Laboratory and the University Animal House.

Members of the British Veterinary Association will be welcome at the Congress, details of which may be obtained from the Laboratory Animals Bureau, M.R.C. Laboratories, Holly Hill, London, N.W.3 (Hampstead 2232).

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HOLIDAY IN FRANCE

Dr. Godéchoux, of Bailly-Romainvilliers, Par Serris, Seine et Marne, Chief Editor of *L'Action Vétérinaire*, wishes to arrange an exchange between his grandson, Jean-Michel Labonnélie, aged 15, who wants to become a veterinary surgeon, and the son or daughter (Jean-Michel has a younger sister and brother) of an English veterinary surgeon *in country practice*.

He would like Jean-Michel to come to England during the Easter holidays from April 11th to 24th and for one month in the summer holidays—either July, August or September. In return he offers hospitality to an English child for two months during the summer holidays—July to September. In July and August the family will be staying by the sea at the Isle of Oléron, and in September they will be at Paris or nearby. (At Easter the family will be travelling and so would not be able to receive the visit of the English boy or girl at that time).

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VETERINARY ARTISTS

British veterinary surgeons were well represented at the 26th Exhibition of paintings by veterinary surgeons, doctors, pharmacists and members of other scientific professions which was held in Paris recently. Among the exhibitors, Mr. A. C. Shuttleworth, M.V.Sc., F.R.C.V.S., sent in an admirable portrait of a horse, "Golden Jap," which was favourably noticed in the Supplement to *La Presse Medicale*. Mr. H. Pearson Blackie, M.R.C.V.S., exhibited two works—"La Luz du Sol 1953" and "Bar Mare Nostrum Sitges."

The exhibition was opened by Monsieur Paul Coste Floret, Minister of Public Health, and among others present were Mr. Harvey Wood, President of the British Council, who represented the British Embassy, and Mr. G. R. Toogood, who organised the British section of the exhibition.

EASTER VAN HORSE PARADE

The 40th parade of van horses will be held in the Inner Circle, Regent's Park, on Easter Monday morning. The show, organised by the London Van Horse Parade Society, was started in 1904, on the suggestion of the late Lord Woolavington, to encourage the owners and drivers of light van horses to take an intelligent interest in the care and well-being of their animals. It is not competitive. Each exhibit which reaches a standard set by the judges and veterinary surgeons receives a first-class award.

Prizes will be distributed by Miss Gladys Yule, President of the Society.

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INTERNATIONAL STUDENTS CONGRESS

The Association of Alfort Veterinary Students is organising an International Holiday and Congress from July 17th to 31st. The Congress is being held under the auspices of the International Veterinary Students Union, whose Chairman is Mr. Pat Rhatigan, of Dublin. British students are invited to the Congress and each school may nominate an official representative to take part in the discussions.

The cost of attending the Congress is expected to be about 15,000 francs, but full details are available from:—

MM. Victor Lux and Guy Malher, Ecole Nationale Veterinaire, Maisons-Alfort (Seine), France.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

ANTHRAX:

Bute.—Barnauld Farm, Kingarth, Rothesay (Mar. 23).

Kirkcudbright.—High Cleggs Field, Borgue House Farm, Borgue (Mar. 24).

Northants.—Manor Farm, Pytchley, Kettering (Mar. 22).

Notts.—Frentham Farm, Adbolton Lane, Adbolton (Mar. 26).

Somerset.—St. Winifred's Field, Claverton Down, Bath (Mar. 27).

Yorks.—Step Ends Farm, Middleton-in-Teesdale (Mar. 22).

FOWL PEST:

Cambs.—8, Fen Road, Isleham, Ely (Mar. 24).

Lancs.—Park Farm, Rufford, and Moss-side Farm, Rufford, Ormskirk (Mar. 21); Hillocks Farm, Croston; Dab Lane, Little Hoole, Preston (Mar. 22); Jubilee Lane, Poultry Farm, Marton Moss; Ibeetham Place, Layton, Blackpool (Mar. 24); Bakers Farm, Brook Lane, and Lynbrook, Dob Lane, Little Hoole, Preston (Mar. 25).

Lincs.—Lincoln Lane and Glenfield, Lincoln Lane, Metheringham, Lincoln (Mar. 25).

Surrey.—" Brightleigh," Outwood, Redhill (Mar. 27).

SWINE FEVER:

Beds.—41, Barton Road, Harlington, Dunstable (Mar. 23).

Ches.—School Lane Farm, Compstall, Stockport (Mar. 22); Ash House Farm, Darnhall, Tarporley (Mar. 23); Quarry, Castle Rise, Runcorn (Mar. 26).

Kent.—51, Hawley Square, Margate (Mar. 23).

Leics.—19, Holding, Land Settlement Association, Elmesthorpe, Earl Shilton (Mar. 25); Road E, Forrest Road Allotment, Leicester (Mar. 27).

Lincs.—Bracebridge, Heath Hospital, Lincoln; Station Farm, Thornton Abbey, Barton-on-Humber (Mar. 22); Sleaford Road, Branston, Lincoln (Mar. 23); 9, Grammar School Road, Brigg (Mar. 26).

Norfolk.—Church Farm, Banningham, Norwich (Mar. 22); Hill House Farm, Boughton, King's Lynn (Mar. 23).

Staffs.—Mount Pleasant Farm, Cheadle, Stoke-on-Trent (Mar. 24).

Suffolk.—Dairy Farm, Ingham, Bury St. Edmunds (Mar. 24).

Surrey.—Wood-a-bale, Cox's Lane, West Ewell, Epsom (Mar. 22).

Yorks.—Green Lane Allotments, First Lane, Hessle, Hull (Mar. 24); 30a, South Road, High Green, Sheffield (Mar. 25).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

PROTRUSION OF THE INTERVERTEBRAL DISC IN THE DOG

Sir,—In *The Veterinary Record* of March 13th, 1954, Dr. Schnelle draws attention to those aspects of our article on " Protrusion of the Intervertebral Disc in the Dog " (Smith & King, 1954), which refer to the second edition of his book (Schnelle, 1950). We regret any suggestion that we have not given Dr. Schnelle sufficient credit for his work, which is respected by the veterinary profession in this and many other countries.

It seems that the main objections are (1) that the implications of " nevertheless " (italicised in his letter) are unfounded, (2) that the word " slipping " (which we used in inverted commas) does not appear in that edition of his book, and (3) that the priority of his own work was not acknowledged. It is further suggested that our abstract was not drawn from the edition we indicate.

On this latter point we would affirm that we used only the second edition, basing our abstract not only on page 125, the page he points to in his letter, but on pages 125-129, which is the whole section on " Intervertebral Disc Protrusion and Calcification."

We used " nevertheless " to show that although the concept of protrusion of the nucleus pulposus was known in America the disease process apparently was not fully understood. This opinion we based on the section mentioned above, which contains the statements on calcification and on conformation. Also, it seemed to us, on reading Dr. Schnelle's account, that the view was held that the whole disc might slip; this we assumed from the following lines on page 128: " We reason here that the intervertebral disc slipped in the first instance, probably from exaggerated motion of the spine. Once the disc had become detached from its normal position, it became calcified as a normal physiopathological process."

With regard to Dr. Schnelle's second objection, it is true that he does not use the word " slipping," although " slipped " appears several times. Our use of inverted commas in the original article was meant not to indicate direct quotation but to mark an unsatisfactory term popularly used in discussing protrusion of the nucleus pulposus. We regret any misunderstanding which may have arisen from the use of this convention.

Concerning the priority of the reference to a case where an intervertebral disc protrusion syndrome was associated with a calcified disc (Schnelle, 1938), we would draw attention to the work of Pommer. In 1937 this worker analysed his radiological examinations of 1,162 dogs and cats showing intervertebral disc protrusion syndromes and found that 29·5 per cent. had calcified discs. He failed to connect the syndromes with protrusion of the nucleus pulposus, this step being taken in 1939 by Tillmans; articles failing to make this connection were not considered relevant to our review unless they were of particular historical interest.

We trust that Dr. Schnelle will find these explanations satisfactory.—Yours faithfully, R. N. SMITH and A. S. KING, Department of Veterinary Anatomy, University of Bristol. *March 26th*, 1954.

REFERENCES

POMMER, A. (1937). In *Tierheilkunde und Tierzucht*,* **11**, 134, edited by STANG, V., & WIRTH, D., cited by TILLMANS (1939).
SCHNELLE, G. B. (1938). *N. Amer. Vet.* **19**, 41.
——. (1950). " Radiology in Small-animal Practice," 2nd edit. Evanston, Illinois.
SMITH, R. N., & KING, A. S. (1954). *Vet. Rec.* **66**, 2-11.
TILLMANS, S. (1939). " Beiträge zur Enchondrosis intervertebralis und der Wirbelkanaltumoren des Hundes." Diss, Giessen.

* We have been unable to obtain this book.

ADVERTISER'S ANNOUNCEMENT

Bayer Products Ltd. announce replacement of the 25 c.c. with a 30 c.c. packing of 'Hepmin.' The proportion of vitamin B_{12} has been increased from 12 micrograms to 50 micrograms per c.c. at the time of preparation, and this represents a most convenient means of administering therapeutic doses of liver, iron, trace elements and vitamin B_{12} in single injections.